

steam tables shows that the saturation pressure at 86° F. is 1-24.8 in. Thus the partial pressure of the air, P_a is

$$P_a = 1-508 - 1-248 = 0-26$$

in. = 18-4 lb. per square foot,
and the volume V of 1 lb. of this
air is given by

If the air is saturated at 86° F.,
the volume of 1 lb. steam given by
steam
tables is 529 c. ft.

$$\frac{\text{Weight of vapour}}{1580}$$

But if the mixture were cooled to
79° F., say, before reaching the air-
pump
with the same total pressure 1-508
in., the partial pressure of the air
would
be 0-512 in., the volume of 1 lb.
air would be
reduced to 792 c. ft., with a
corresponding
reduction of the effective
displacement of the
air-pump, and the weight of
vapour per pound

of air would be
reduced to 1-21
lb.

Fig. 14.—Outline of
Reciprocating



Reciprocating Air-pumps.— A
common
form of air-
pump is
illustrated
in outline in
fig. 14, and
is usually
operated as
a wet air-
pump. The
mixture of
air and
water passes
from the

condenser
through the
foot valves at
the bottom
on the up-
stroke of the
bucket. On
the down-
stroke a
vacuum is
formed on
the top
side of the
bucket, and
when the
pressure
there
is slightly
below that
under the
bucket the
air
flows through
the bucket
valves to the
top side.
Eventually
the bucket
reaches the
water lying
at the
bottom of
the barrel
towards the
end
of the down-
stroke, and
the water
also flows
through the
bucket
valves. On
the next up-
stroke the air
is
compressed
until it
attains a
pressure
slightly
greater than
that over the

During the
final
head
valves, after which it
is delivered through
these valves,
portion of the up-
stroke the water
also is delivered;

remains, filling up
the clearance
space.

A consideration of this action shows that the foot valves are not absolutely necessary, and they are sometimes dispensed with, partly because of the difficulty of getting to these valves for inspection and repair in an emergency.

In the case of slow-speed reciprocating engines, usually an air-pump of this type is directly connected to the engine crosshead through simple